Novel approaches to the estimation of temporal distribution of the demand for parking space

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Research Objective

➤ What are the possibilities and limits of determining temporal distributions of parking demand with data from parking space management and/or GPS-Trip-Data?

Data from Parking Space Management

- inflows and outflows from car parks (2.5 million obs.)
- parking tickets from parking meters (570,000 obs.)

GPS-Trip-Data

way-points from mobile or built-in navigation devices
(5.4 million trips)

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Temporal Distribution of Parking Demand

➢ Visualizations of inflow and outflow parking traffic as well as parking space occupancy by hours of day and days of week.

➢ Aggregated over all demand groups or differentiated by demand groups:
- • inhabitants
- • employees and students
- • customers
- • visitors and guests

➢ Differentiated by city area types:
- • city center
- • old town area near the city center
- • residential area
- • commercial and industrial area
- • park-and-ride area

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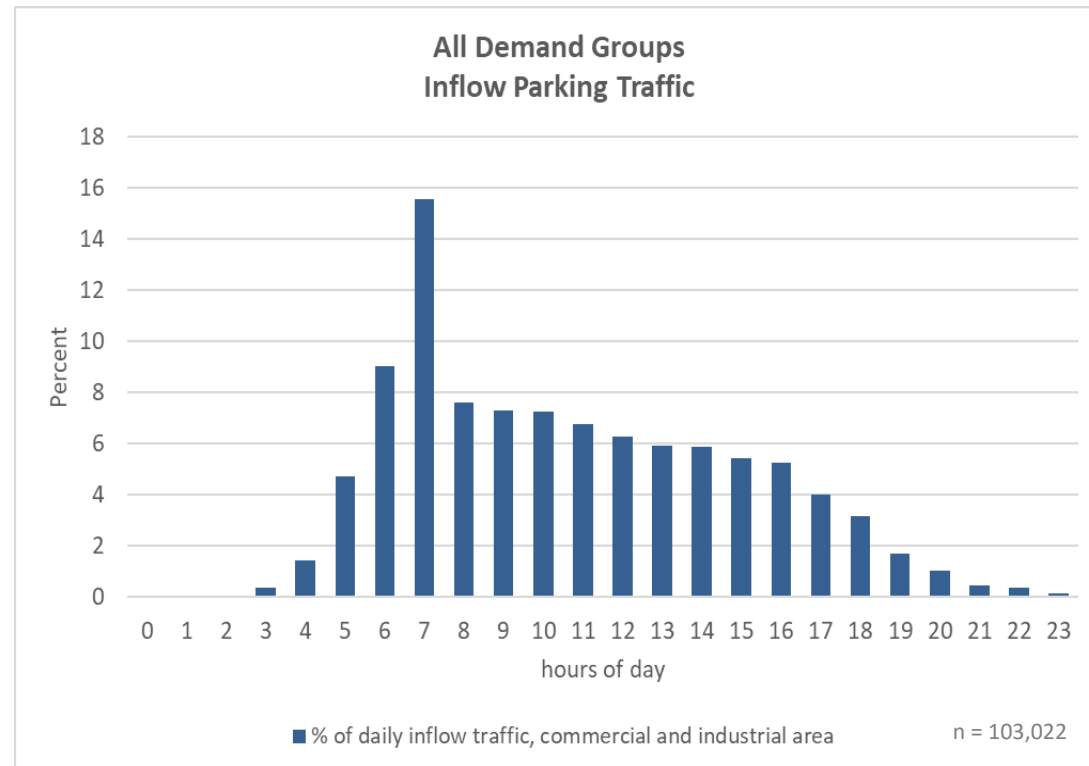
Comparison of Methods

Characteristics	Parking Space Surveys	Parking Space Management Data	GPS-Trip-Data
Time requirement	medium (survey, evaluation)	low (as long as the evaluation is automated)	
Separate evaluation by geographical area	limited (only a few streets)	city area with parking space management	entire city area
Transferability to city area types	limited	assignment to city area types is possible	
Assignment to demand groups	retrospectively using assignment-schemes	retrospectively using assignment-schemes	
Costs	medium	low	high
Updateability	low	regular updates are possible (e.g. annually)	

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Procedure (1/2)

➢ **Data Processing**

- Is the required information available in the data?

- Start and end time of each parking process, parking duration

- Estimation / prediction possible if necessary?

- For GPS-Trip-Data: Is the observed trip a parking process?

➢ **Data Assignment**

- Each observed parking process has to be assigned to a demand group.

- Each observed parking process has to be assigned to a city area type.
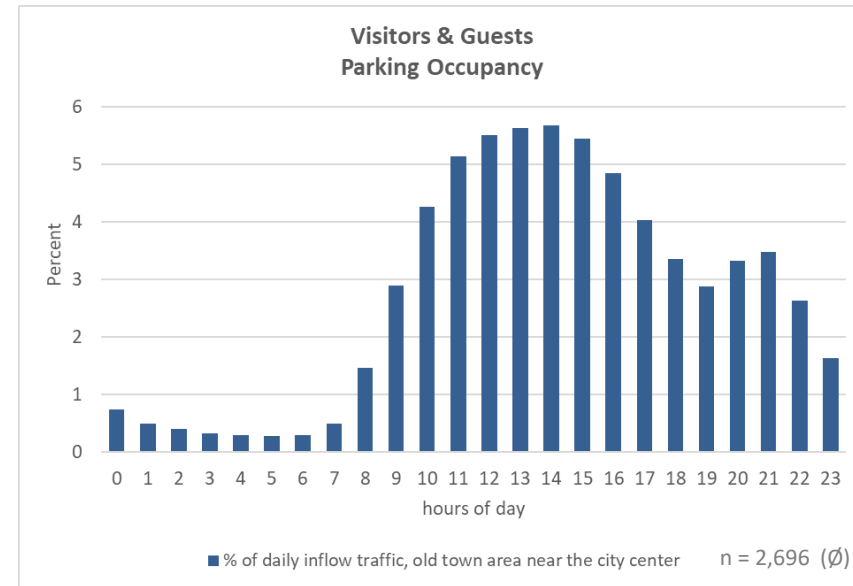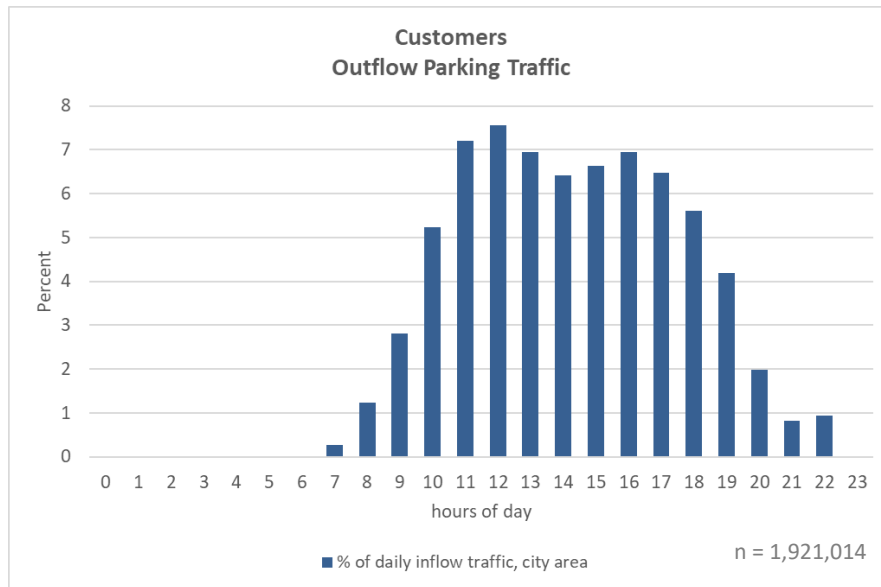
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Procedure (2/2)

➢ **Determining Temporal Distributions**

- Adding inflows / outflows for each hour (0 to 23) of day by demand group and day of the year.

- Determination of parking space occupancy (overlapping parking episodes) for each hour of the year and demand group.

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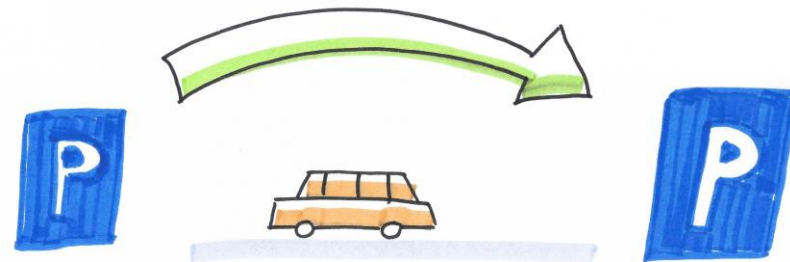
Results - Parking Space Management Data

➤ Low-cost data, well suited for city area types with high parking pressure (city center, old town center near the city).

Customers Outflow Parking Traffic
■ % of daily inflow traffic, city area   n = 1,921,014

Visitors & Guests Parking Occupancy
■ % of daily inflow traffic, old town area near the city center   n = 2,696 (Ø)

➤ Problems arise if parking management offers daily or weekly parking tickets (determining the exact end of parking is not possible). In these cases, the parking space management should be changed in such a way that entrances and exits can be observed.

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Results - GPS-Trip-Data

➢ Expensive and (still) of limited use. Plausible aggregated temporal distributions can be generated.

➢ Helpful there where parking space management data are missing.

➢ Further research is needed in in determining parking durations and assigning parking processes to demand groups.

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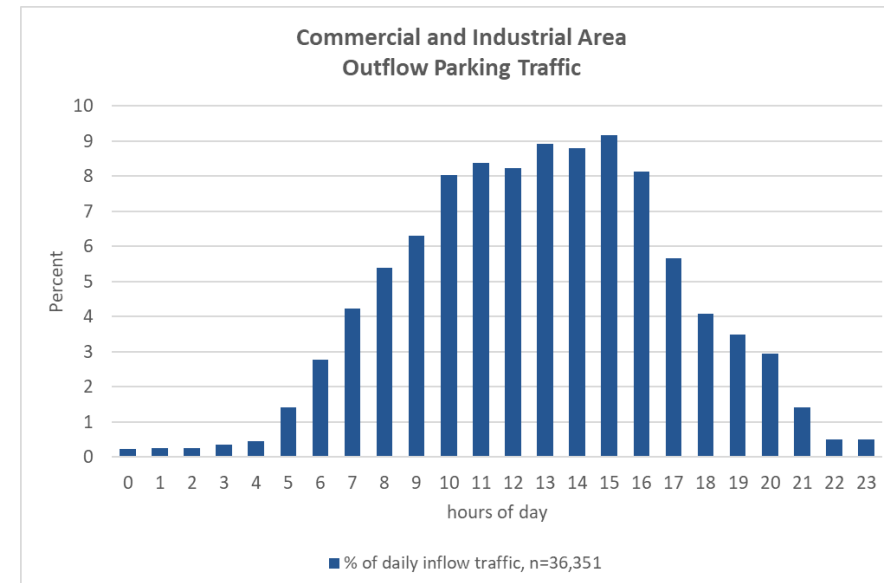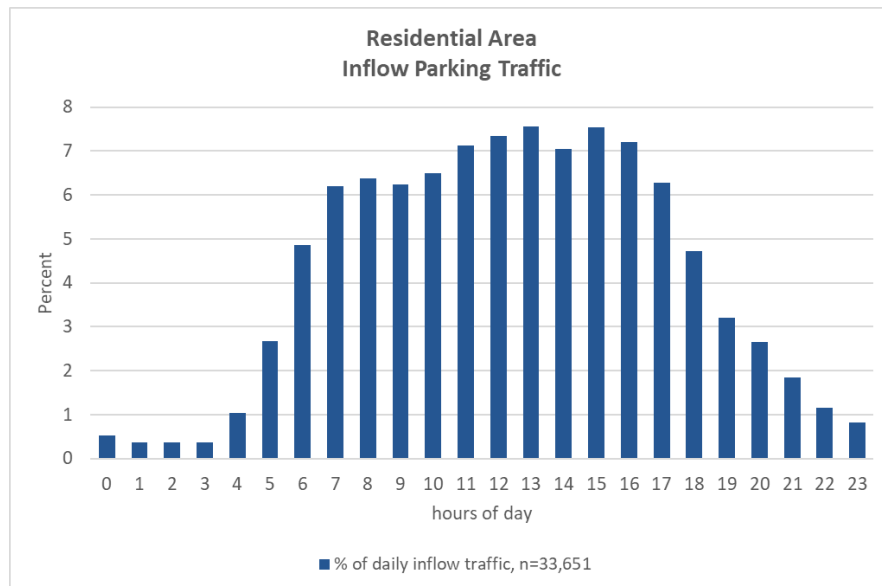
Thank you for your attention!

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➢ Final report of the research project is available at: **www.relut.de**.

➢ Funded by: